## CLAIMS:

1. A look up engine comprising a storage means for storing a plurality of entries, each entry comprising a value and an associated key value, such that, in operation, a look up is carried out by outputting a value which is associated with the stored key value which matches an input key value, the look up engine comprising a plurality of look up state machines connected in parallel to enable multiple look ups to be carried out concurrently.

2. A look up engine according to claim 1, wherein the entries are stored in a trie structure.

3. A look up engine according to claim 2, wherein the trie structure is a PATRICIA trie structure.

4. A look up engine according to claim 1 further comprising an input buffer and an output buffer.

5. A look up engine according to claim 4, wherein the look up engine further comprises a distributor for distributing the input key values between the plurality of look up state machines.

6. A look up engine according to claim 5, wherein the look up engine further comprises a collector for collecting the outputs from the plurality of look up state machines for outputting the lookup value.

7. A look up engine according to claim 1, wherein the length of the key values and the values is fixed.

8. A look up engine according to any one of claims 1, wherein the length of the key value and the values is variable.

9. A look up engine according to claim 1, wherein the look up engine further comprises a tagging mechanism in which each key value has a tag associated therewith such that the output values can be ordered in accordance with the order of receipt of the input key value.

10. A look up engine according to claim 1, wherein the look up engine comprises means for storing the identity of a requestor requesting look up for each look up request such that the output value is sent to the correct location.

11. A look up engine according to claim 1, wherein at least one of the output values comprises an error message which is output to indicate a look up failure.

12. A look up engine according to claim 11, wherein the error message further comprising additional data including indication of the type of error.

13. A look up engine according to claim 12, wherein the additional data includes indication of the number of bits of the input key value which matched.

14. A look up engine according to claim 11, wherein each entry further comprises a skip value and each key value comprises a plurality of bits, and wherein the error message is sent if the skip

value mismatches the skipped bits of the input key value.

15. A look up engine according to claim 1, wherein the storage means comprises internal and/or external memory.

16. A look up engine according to claim 15, wherein the storage means comprises a plurality of independent, parallel memory banks, each memory bank containing at least one table of the plurality of entries.

17. A look up engine according to claim 16, wherein the tables are mutually exclusive.

18. A look up engine according to claim 17, wherein the input key value comprises a table identifier for identifying which of the tables is required.

19. A look up engine according to claim 15, wherein the look up state machines can be bypassed in operation such that the storage means is utilised as memory for a processing means.

20. A look up engine according to claim 19, wherein the storage means is dynamically partitioned for use as memory by the processing means and for storing the plurality of entries.

21. A method for looking up a value, the method comprising the steps of:
    (a) receiving a key value;
    (b) comparing the input key value with a plurality of stored key values;

(c) outputting the value associated with the stored key value that matches the input key value, wherein steps (a), (b) and (c) are carried out concurrently.

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22. A method for looking up a value, the method comprising the steps of:

(a) receiving a key value;
dividing the input key value into a

10 plurality of predetermined portions;

(b) comparing each predetermined portion of the input key value with a plurality of stored key values;

(c) outputting the value associated with the

15 stored key value that matches the predetermined portion of the input key value;

(d) assembling each lookuped value to produce a final key value;

20 (e) comparing the final key value with a plurality of stored key values; and

(f) outputting the value associated with the stored key value that matches the final key value, wherein steps (b) to (d) are

25 carried out concurrently.

23. A computer system comprising a plurality of processing means interconnected via a bus system, the computer system further comprising a look up

30 engine, the look up engine comprising a storage means for storing a plurality of entries, each entry comprising a value and an associated key value, such that, in operation, a look up is carried out by outputting a value which is

associated with the stored key value which matches an input key value, the look up engine comprising a plurality of look up state machines connected in parallel to enable multiple look ups to be carried out concurrently.

24. A computer system according to claim 23, wherein the look up engine is connected to the bus system via a plurality of parallel interface units, the interface units allowing concurrent update of the entries and look up.

25. A computer system according to claim 23, wherein multiple keys are submitted for look up in a single bus transaction.

26. A look up engine comprising at least one storage means for storing a plurality of entries, each entry comprises a key value, an associated value and a skip value, such that, in operation a look up is carried out by outputting a value which is associated with the stored key value which matches an input key value, the input key comprising a plurality of bits, if the skipped bits of the input key value and the associated skip value mismatches, an error message is output to indicate lookup failure.

27. A look up engine according to claim 26, wherein the error message further comprising additional data including indication of the type of error.

28. A look up engine according to claim 26, wherein multiple look ups are carried out concurrently.

29. A method for looking up a value, each value
   having a key value and a skip value associated
   therewith, the method comprising the steps of:

5          receiving a key value comprising a plurality
   of bits;

          comparing the input key value with a
   plurality of stored key values;

          comparing the skip value associated with the
   value corresponding to the input key value with

10        the skipped bits of the input key value;

          outputting the value associated with the
   stored key value that matches the input key value
   if the skip value matches the skipped bits of the
   input key value, and outputting an error message

15        to indicate look up failure if the skip value does
   not match the skipped bits of the input key.

30. A method according to claim 29, wherein the output
   error message comprises additional data including

20        an indication of the type of error.

31. A method according to claim 29, wherein multiple
   look ups are carried out concurrently.

25  32. A method of constructing a trie in a storage
   means, the trie comprising a plurality of entries,
   the method comprising the steps of:

          identifying overlapping ranges between the
   plurality of entries;

30              splitting the identified overlapping ranges;
          storing the plurality of entries within a
   trie structure.

33. A method according to claim 32, wherein the depth

35        of the trie is programmable.

34. A method according to claim 33, wherein the
    entries are arranged in a PATRICIA trie.

5   35. A method according to any one of claim 32,
    wherein, the method further comprises the step of:
        providing each entry with a skip value such
    that, during the look up operation, the skip value
    associated with the value corresponding to the
10  input key value is compared with the skipped bits
    of the input key value;
        outputting the value associated with the
    stored key value that matches the input key value
    if the skip value matches the skipped bits of the
15  input key value, and outputting an error message
    to indicate look up failure if the skip value does
    not match the skipped bits of the input key.

    36. A look up engine constructed and updated in
20  accordance with a method of constructing a trie in
    a storage means, the trie comprising a plurality
    of entries, the method comprising the steps of:
        identifying overlapping ranges between the
    plurality of entries;
25  splitting the identified overlapping ranges;
        storing the plurality of entries within a
    trie structure.


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